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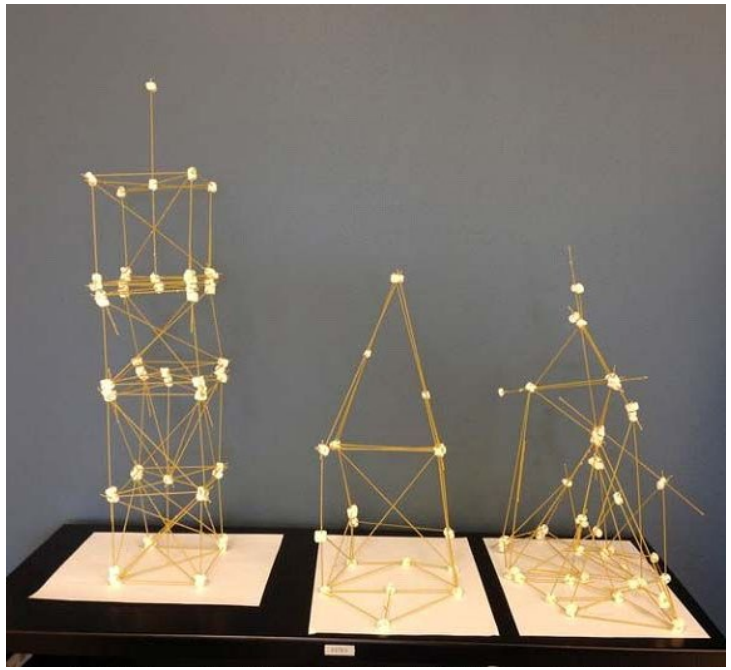
Gamification in Education – A Supply Chain and Logistics Management Perspective

Ahmed Tarek El-Said, Stephen Jones

Student engagement and the traditional teaching approach.

Concept Pedagogy: Pedagogical foundations for SC and ITSO Modules



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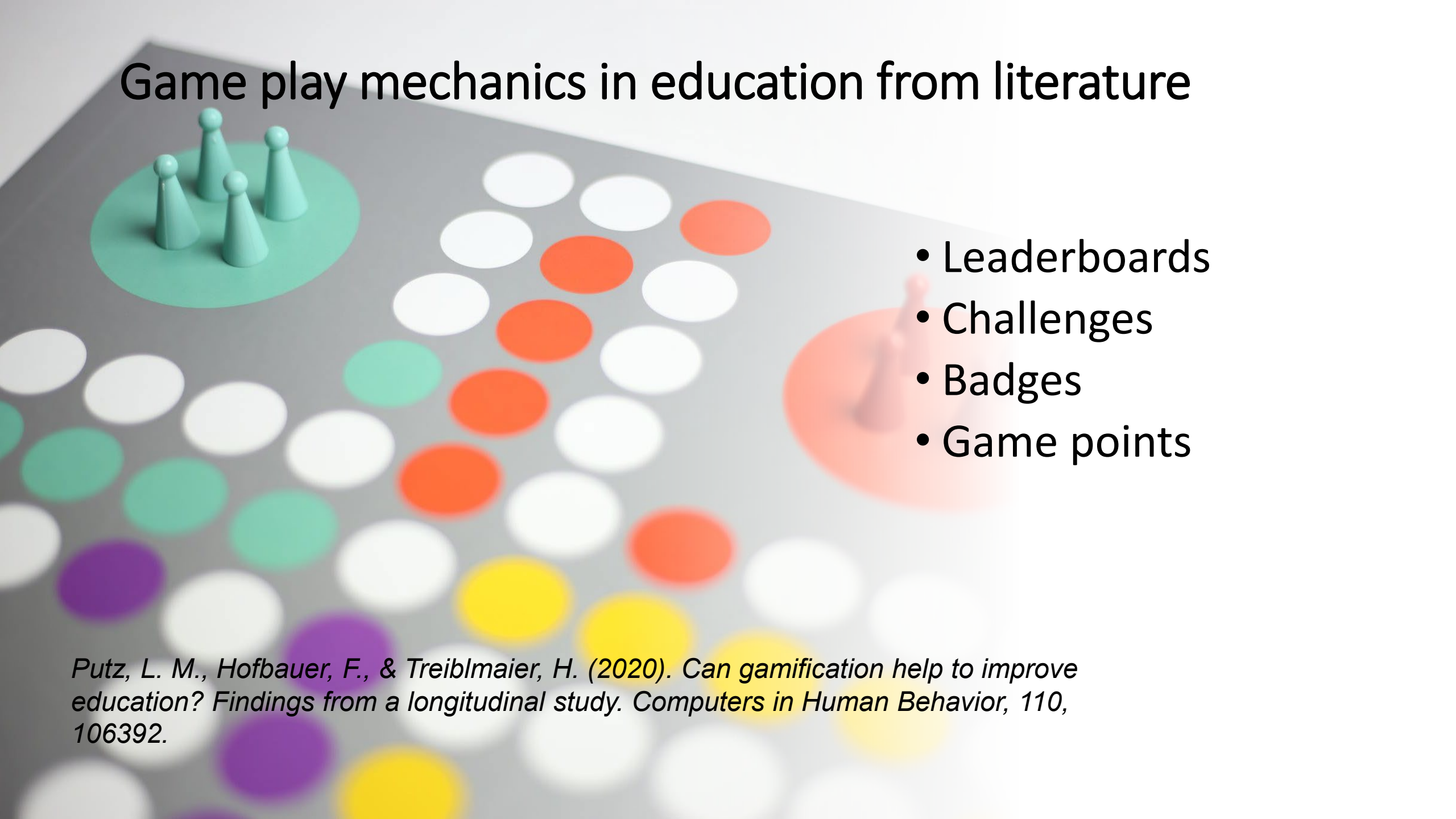
Gamification in Education

Game play mechanics in education from literature



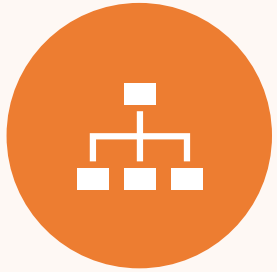
- Leaderboards
- Challenges
- Badges
- Game points

Putz, L. M., Hofbauer, F., & Treiblmaier, H. (2020). Can gamification help to improve education? Findings from a longitudinal study. Computers in Human Behavior, 110, 106392.

Educational games in the supply chain and logistics field

- The Beer Game (Sterman, 2000)
- The Fresh Connection (Cotter, et al. (2009)
- Port Simulator Hamburg (Wood and Reiners, 2012)
- The Lego Truck Game (Johansen and Mikkelsen, 1994)

Research Problem: Develop game to fit learning outcomes



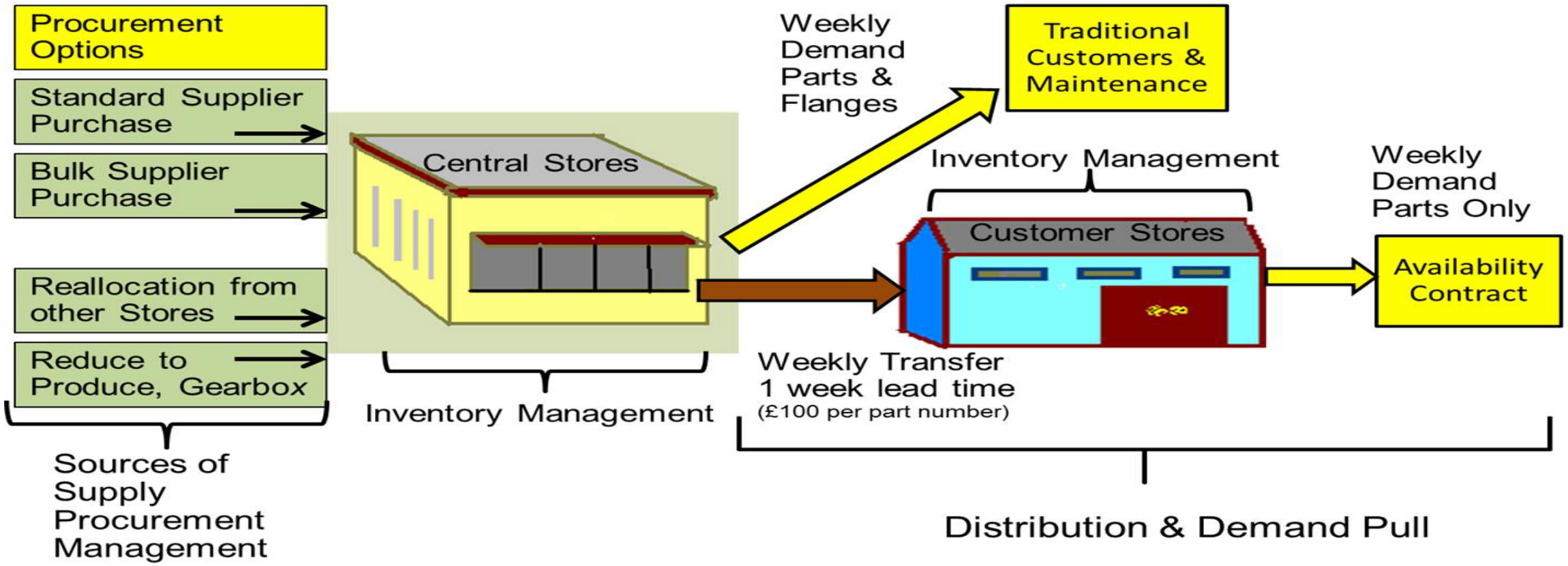
CRITICALLY EVALUATE

IMPLEMENT ADVANCED TECHNIQUES.

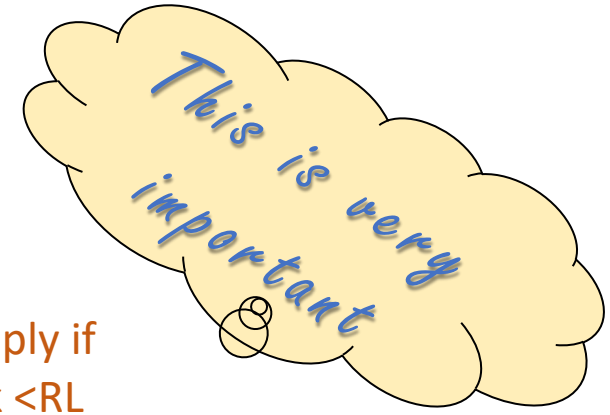
MANAGE PROCUREMENT AND INVENTORY RISKS

MONITOR AND ASSESS PROCUREMENT AND INVENTORY PERFORMANCE

The Wolfhound Military Vehicle Simulation



Stock Control Formulae



Safety stock -

- **Used to Expedite Delivery**
- **Formula: CSF x MAD x Sq Rt (LT)**

Chase supply if
Free stock <RL

Review Level

- **Used to trigger Supply Orders**
- **Formula: Forecast Demand x LT + Safety Stock**

Resupply if
stock + purchase orders outstanding <RL

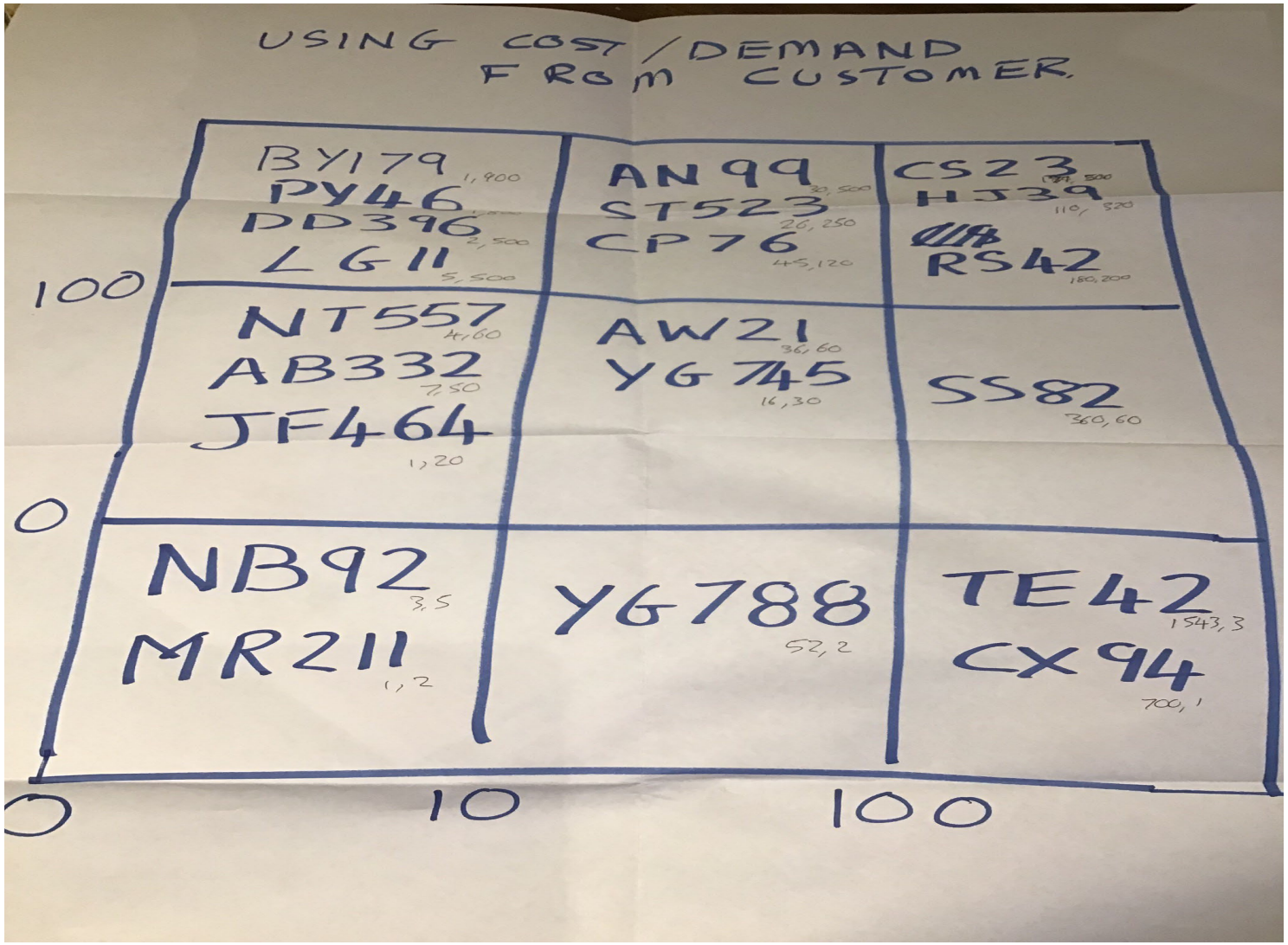
Average Stock

- **Used to Minimise Stock Value**
- **Formula: 1/2 x Delivery Quantity + Safety Stock**
- **= 1/2 x Del Q + CSF x MAD x SqRt(LT)**

Plan supplier delivery frequency

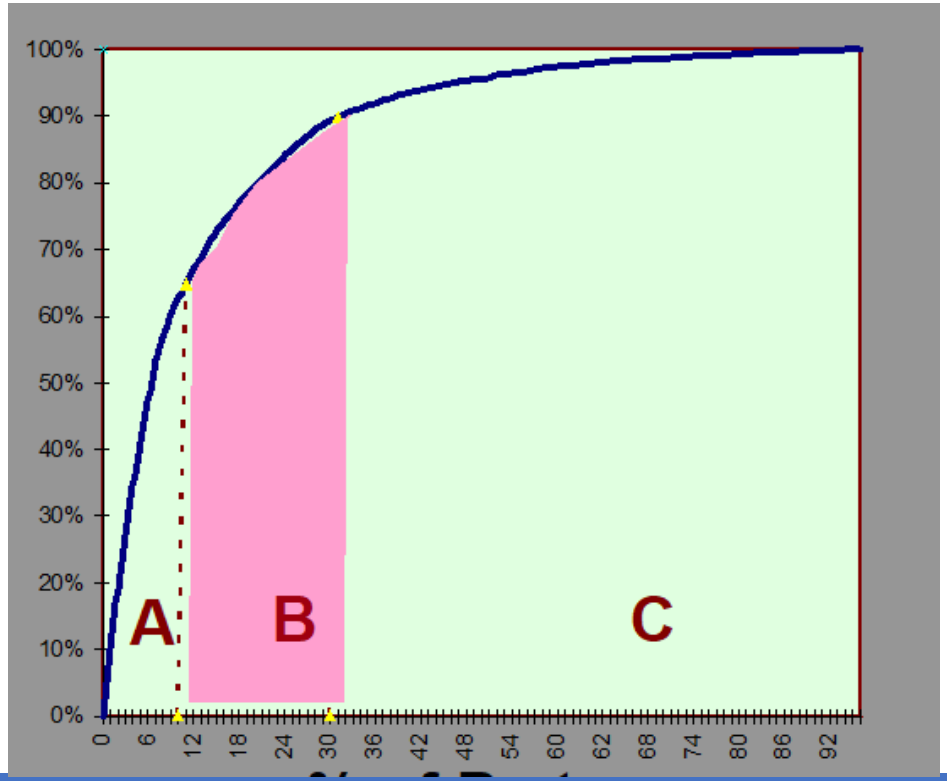
Knowledge
Skill
Behaviours

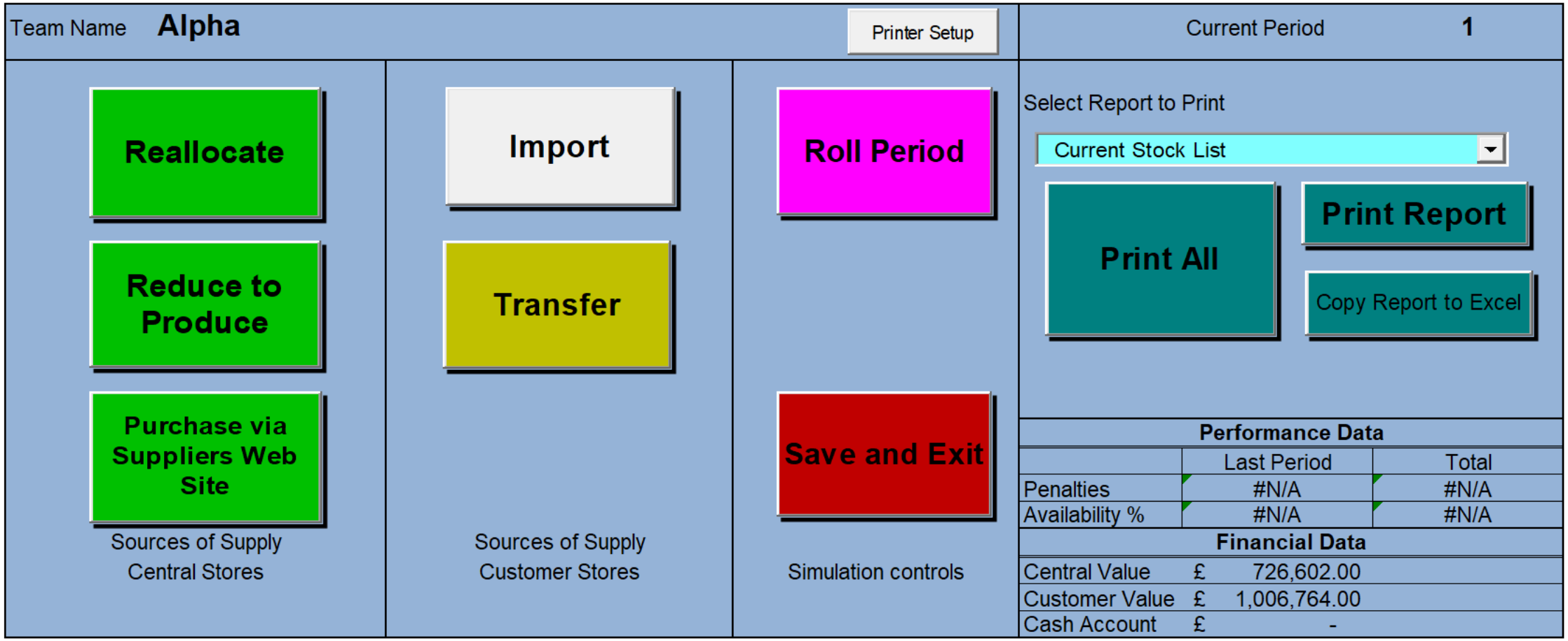
- Need to work as a team (usually 6)
- Assign roles and responsibilities
- Categorise and develop strategies for variety of SKUs (21)
- Develop control policies for each category
- Time pressures for decisions
- Evaluate and select supply options
- Use historical records for predictive analysis forecasting
- Monitor and assess simulation output for overall optimisation
- Maintain historical demand records
- Mitigate and recover against risks and disruptions
- Present their key learning points and performance
- Receive constructive feedback



9 Box

ABC using Pareto





Active Printer: Microsoft Print to PDF on Ne01:

Item Identity		Standard Purchase			Discounted Bulk		
Part Code	Description	Lead Time	Batch quantity	Single Unit Price	Lead Time	Batch Quantity	Single Unit Price
GBX	**Gearbox**	1	3	£1000	1	10	£720
NBY100	Flange Assemblies	These are not purchased as a whole, they are assembled see page 2.					
MR211	Flange Body	1	1	£2	1	100	£1
AB332	Lock Washer 15mm	1	4	£50	2	200	£30
ST523	HT Bolts 15 x 50mm	1	1	£250	1	100	£200
JF464	Centraflex coupler	2	5	£20	2	50	£17
YG745	Washer 15mm	1	2	£30	3	1	£20
DD396	HT Nut 15mm	1	1	£500	2	200	£400
NT557	Hydraulic Coupling	2	2	£60	2	10	£100
YG788	Clutch Plate	1	6	£2	1	1	£2
BY179	Shaft 50mm X 1m	2	5	£900	1	3	£1,500
NB920	Bearings 50mm	1	11	£5	3	11	£3
AW21	Missile detector	1	1	£600	2	1	£550
CP76	Shielded handle	1	50	£120	2	50	£100
CS23	Armour plate door	1	100	£500	1	20	£600
CX94	Washer 5mm	1	1000	£1	2	400	£1
HJ39	Bullet Proof (BP)wing	2	600	£320	1	600	£250
LG11	Left BP window	1	50	£500	1	10	£520
NA99	Right BP window	1	100	£500	1	30	£550
PY46	Full Body Armour	1	300	£4000	1	100	£4800
RS42	Front Machine gun	2	1000	£200	1	50	£150
SS82	PVC Launcher Cover	2	2000	£60	3	500	£60
TE42	Small Spring	1	1	£3	1	20000	£2

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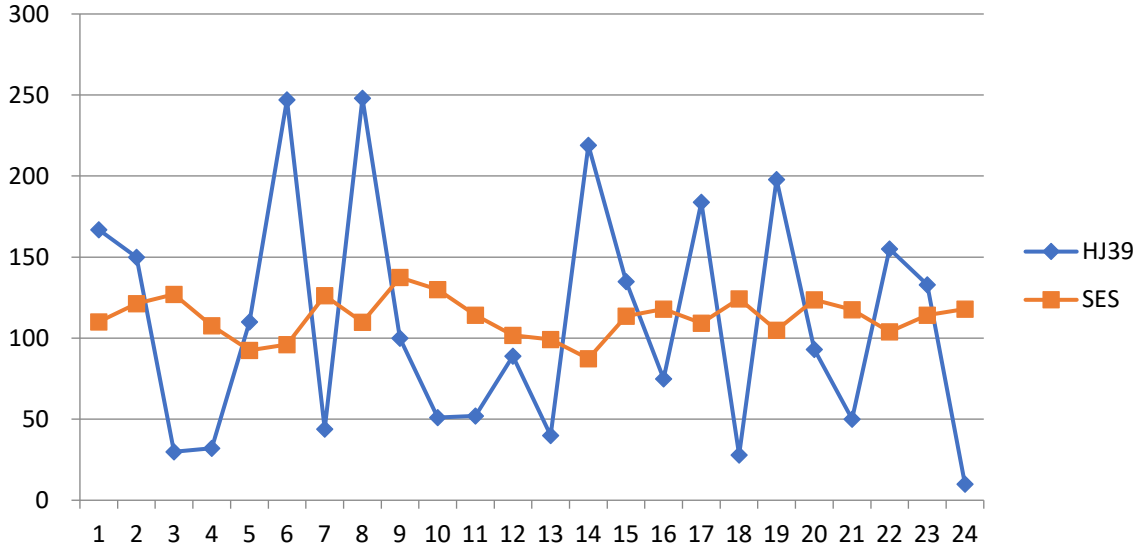
300
250
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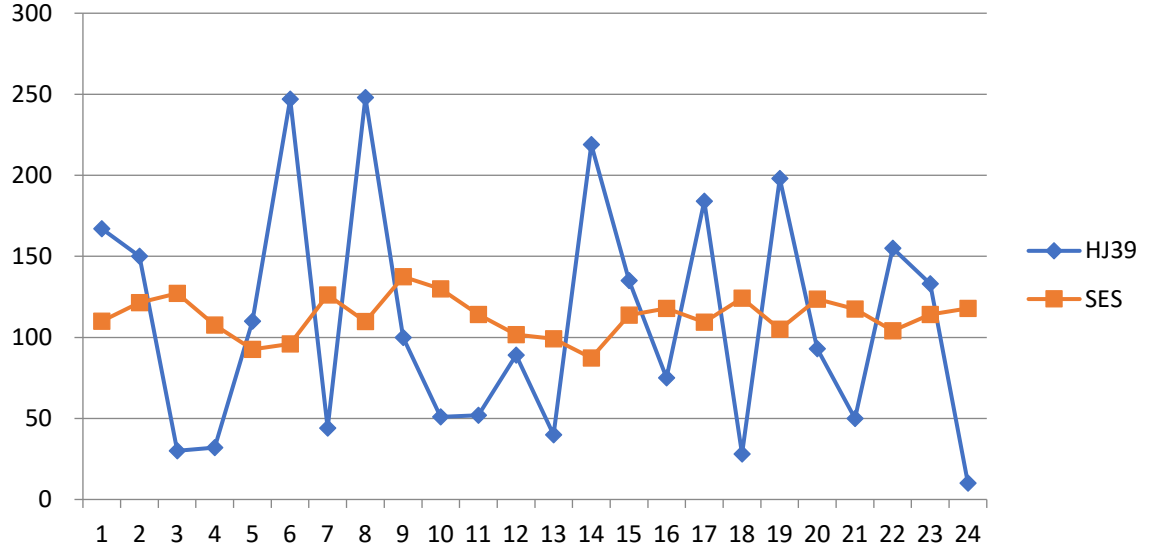
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
HJ39
SES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HJ39
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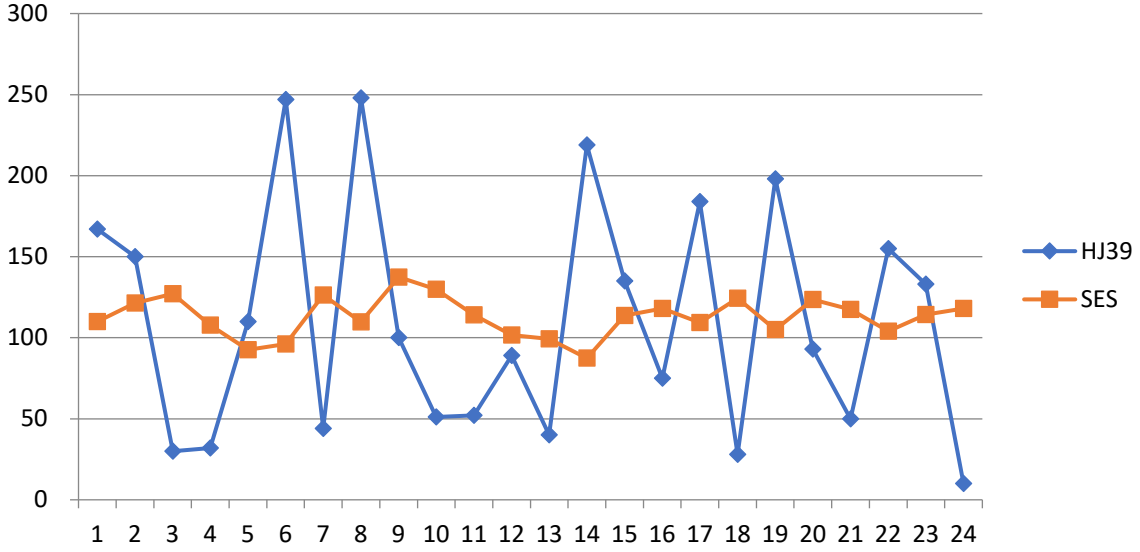
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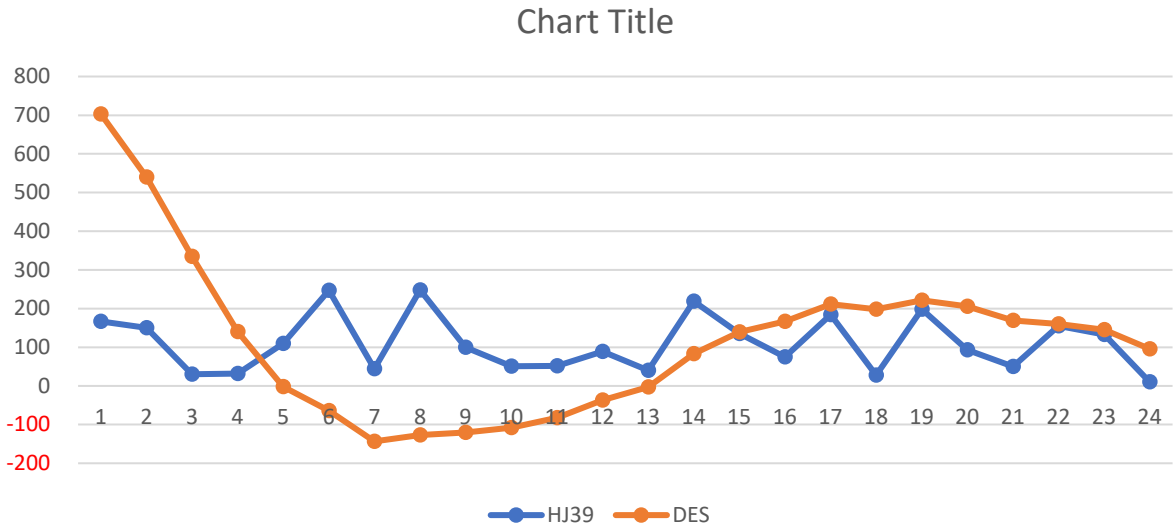
HJ39
SES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800
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500
400
300
200
100
0
-100
-200
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
HJ39
DES

Power Bi Link

https://app.powerbi.com/groups/1dac3a5f-5365-48ea-b785-d7eb5887cafa/reports/1f328d96-b120-4fca-8047-14cea8baa227?ctid=09bacfbd-47ef-4465-9265-3546f2eaf6bc&pbi_source=linkShare&bookmarkGuid=fd6f1953-0cbb-4fd6-b8d1-e642337c72db

Penalties

Results PowerBi All Teams

Class

Part

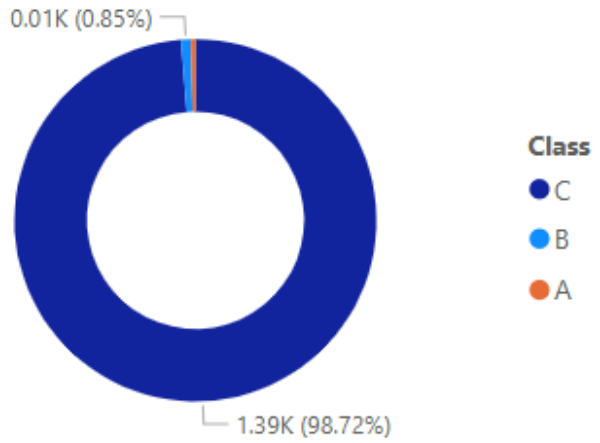
Part

All

6365
Total Penalties

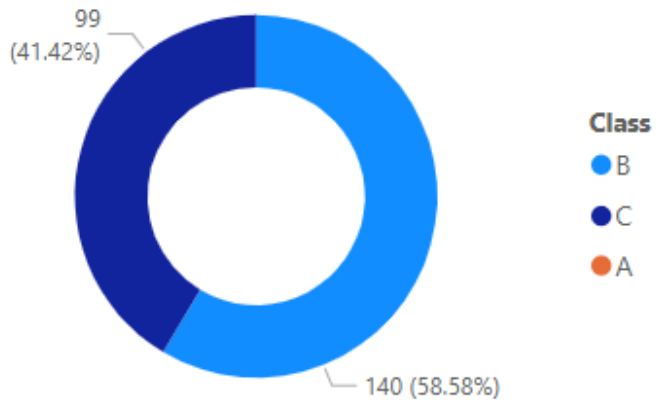
01-Alpha

1404
Total Penalties



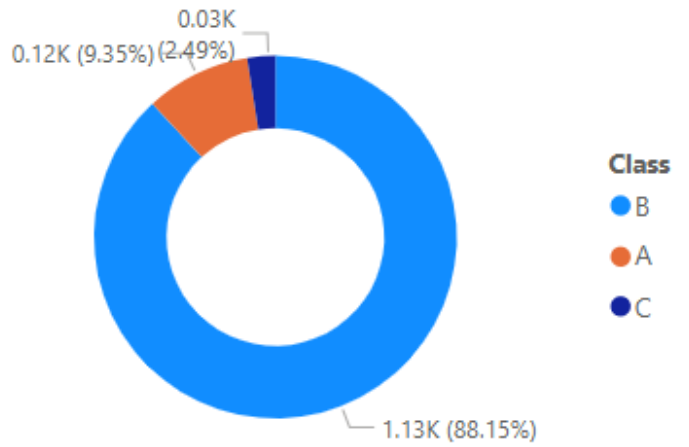
02-Beta

239
Total Penalties



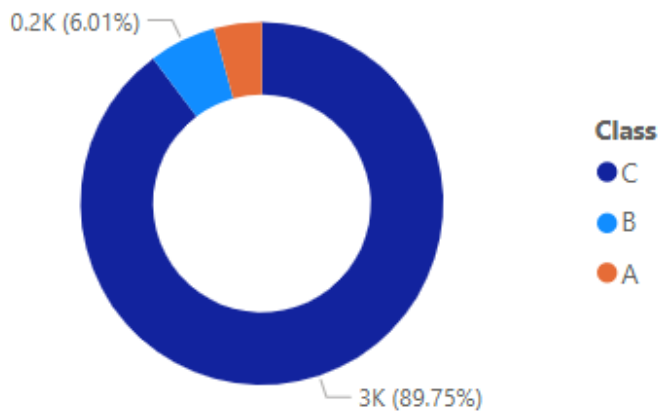
03-Gamma

1283
Total Penalties



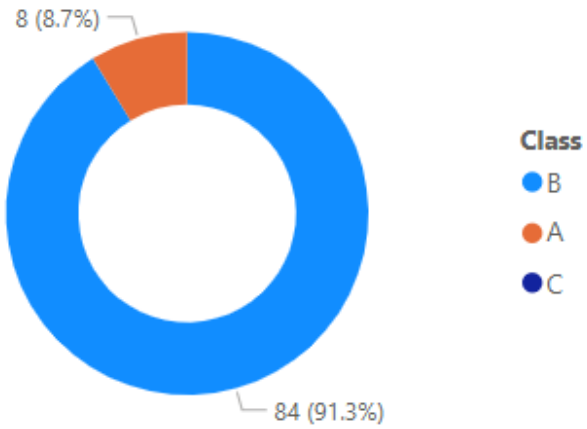
04-Delta

3347
Total Penalties



05-Epsilon

92
Total Penalties



06-Zeta

Penalties

Results PowerBi All Teams

Class

Part

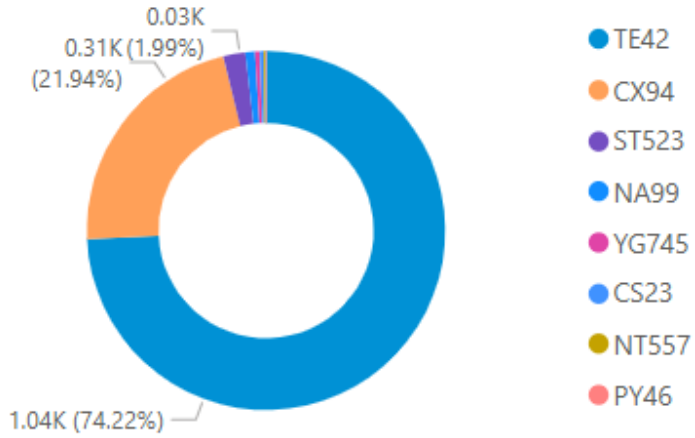
Part

All

6365
Total Penalties

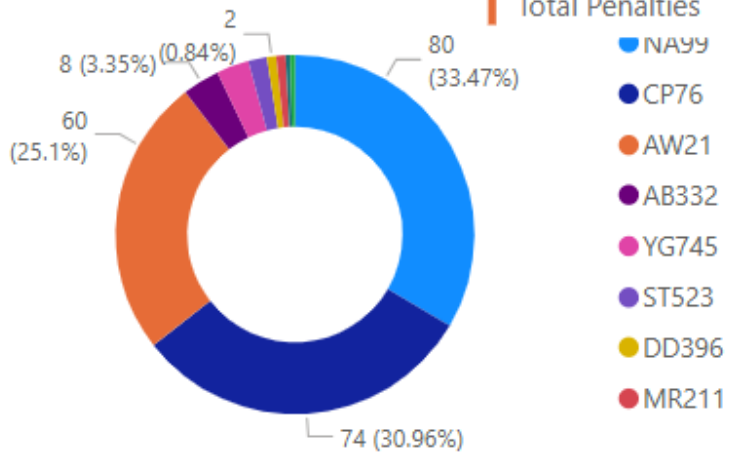
01-Alpha

1404
Total Penalties



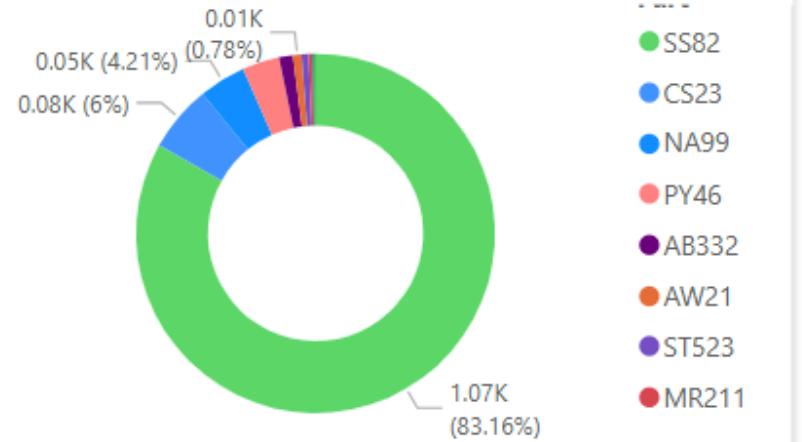
02-Beta

239
Total Penalties



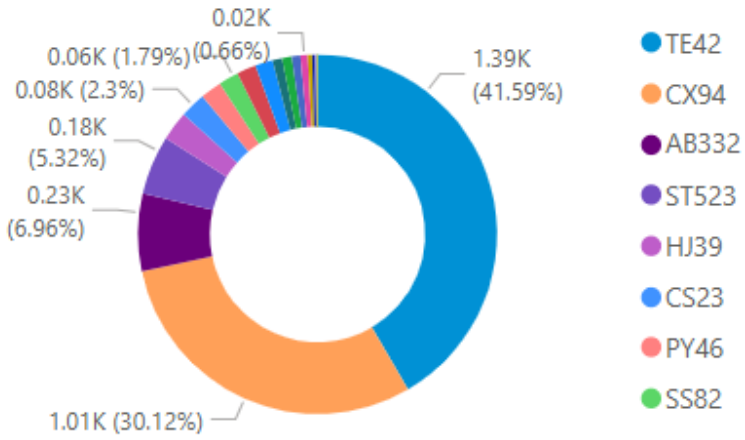
03-Gamma

1283
Total Penalties



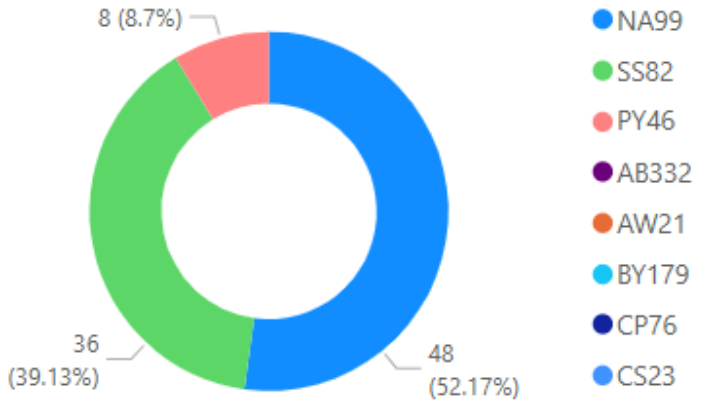
04-Delta

3347
Total Penalties



05-Epsilon

92
Total Penalties



06-Zeta

Duration in Minutes
Period Number 1 2 3 4 5 6 7 8 9 10 11 12
Team
04-Delta
P1 P2 P3 P4 P5 P6 P7 P8 P9
820
03-Gamma
P1 P2 P3 P4 P5 P6 P7 P8 P9
698
01-Alpha
P1 P2 P3 P4 P5 P6 P7 P8 P10
697
02-Beta
P1 P2 P3 P4 P5 P6 P7 P8 P9
645
05-Epsilon
P1 P2 P3 P4 P5 P6 P7 P8 P9 P10 P11 P12
635

Reallocations

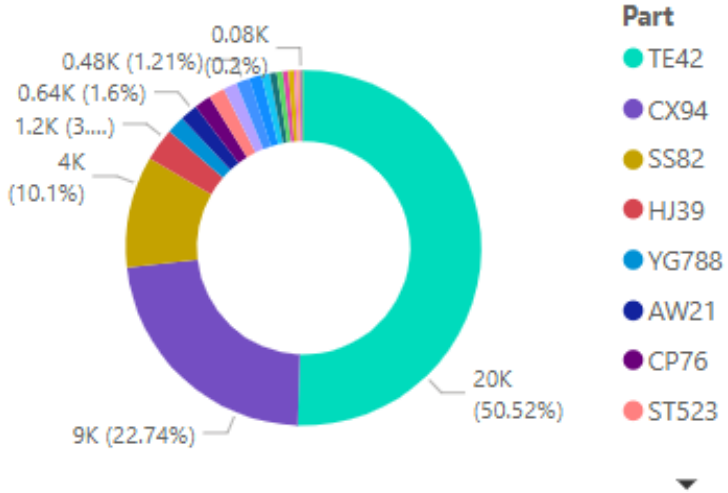
Team

01-Alpha	03-Gamma	05-Epsilon
02-Beta	04-Delta	06-Zeta

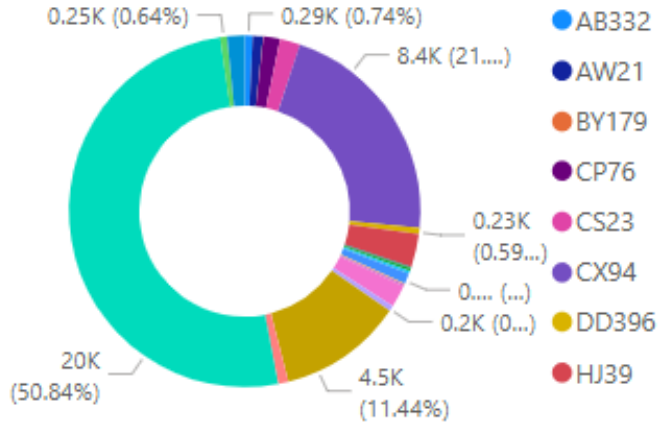
Purchases

Results PowerBi All Teams

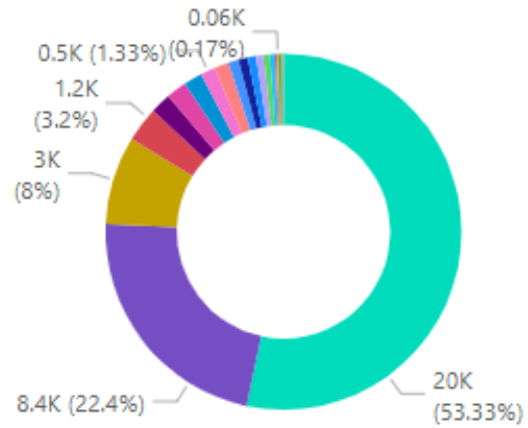
01-Alpha



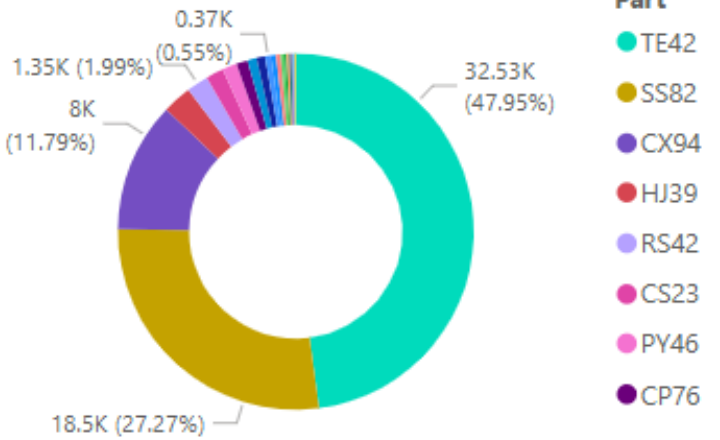
02-Beta



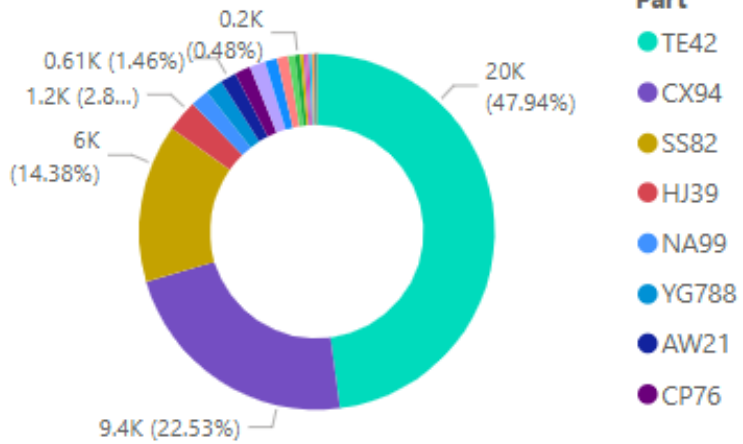
03-Gamma



04-Delta

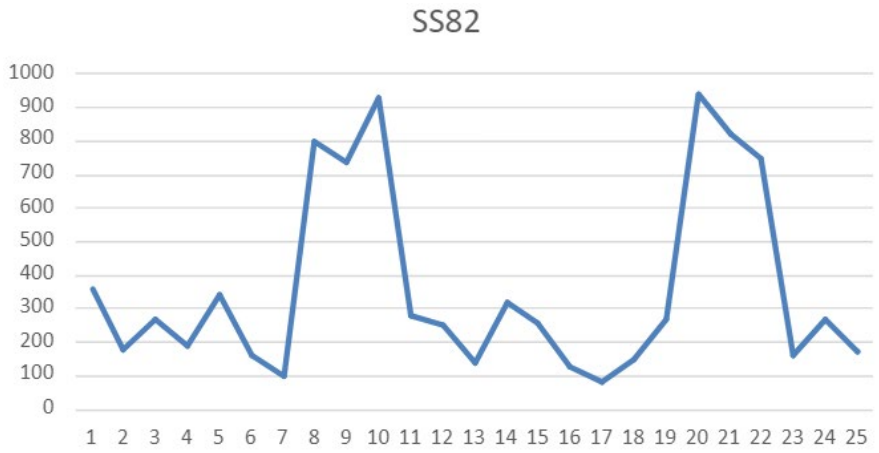


05-Epsilon



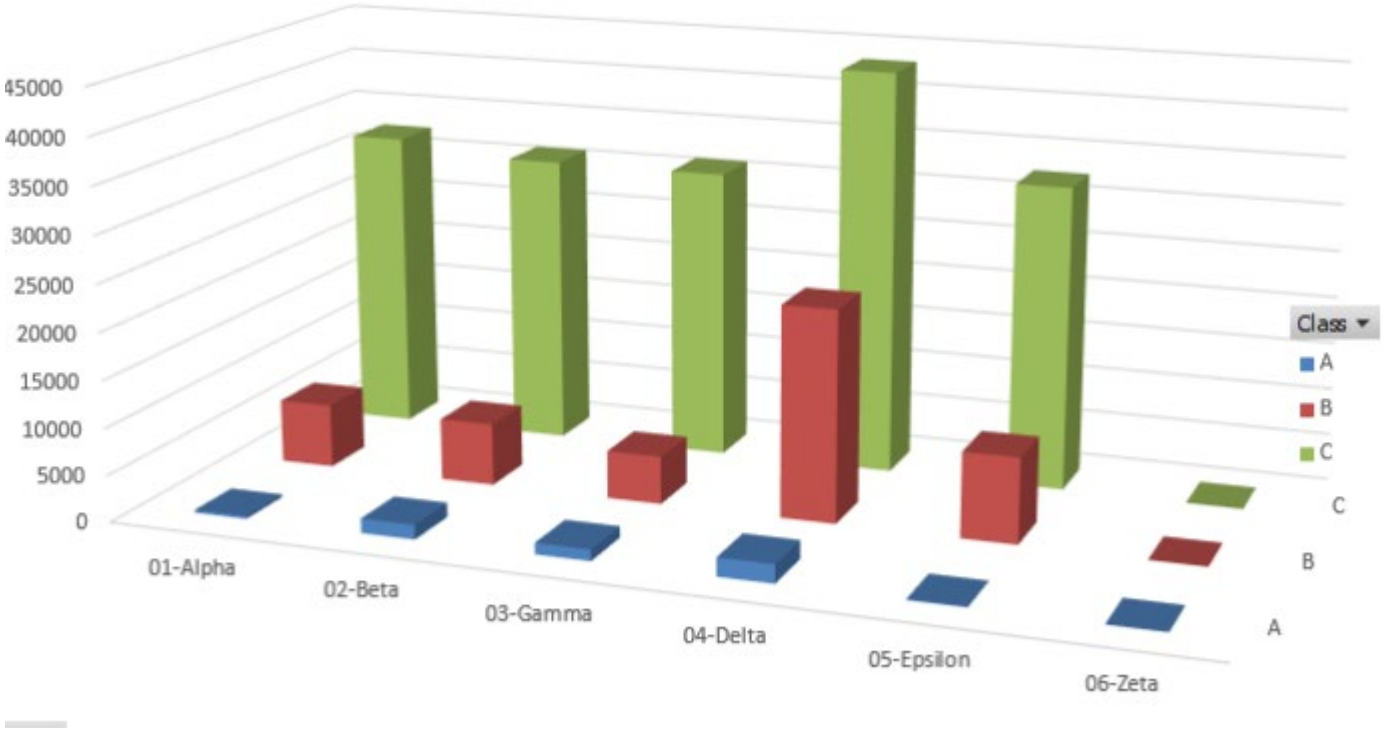
06-Zeta

Penalties for Seasonal Demand

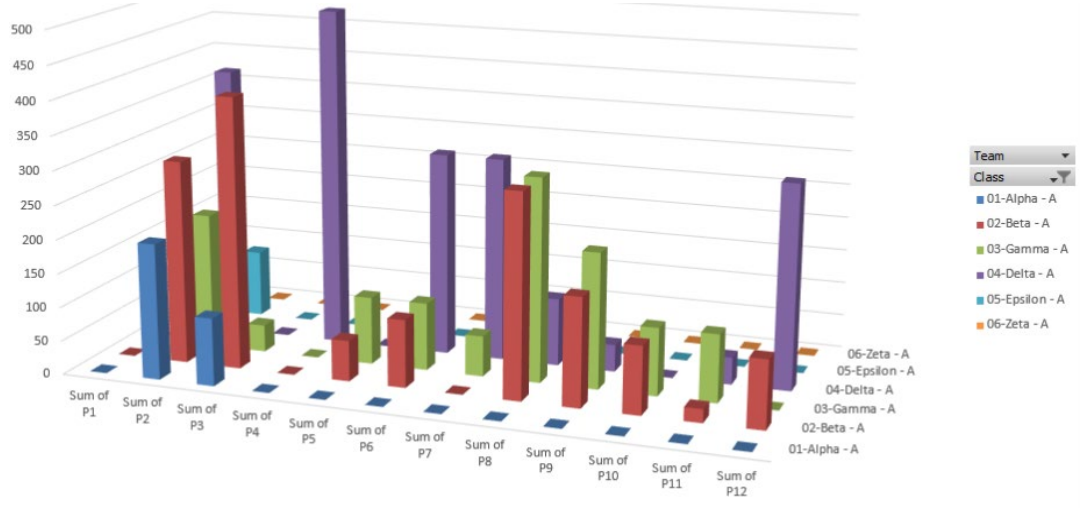


Values	Column Labels 01-Alpha B SS82	02-Beta B SS82	03-Gamma B SS82	04-Delta B SS82	05-Epsilon B SS82
Sum of P1	0	0	0	0	0
Sum of P2	0	0	0	0	0
Sum of P3	0	0	20	0	36
Sum of P4	0	0	0	0	0
Sum of P5	0	0	0	0	0
Sum of P6	0	0	0	20	0
Sum of P7	0	0	0	40	0
Sum of P8	0	0	737	0	0
Sum of P9	0	0	310	0	0
Sum of P10	0	0	0	0	0
Sum of P11	0	0	0	0	0
Sum of P12	0	0	0	0	0
Sum of Total	0	0	1067	60	36

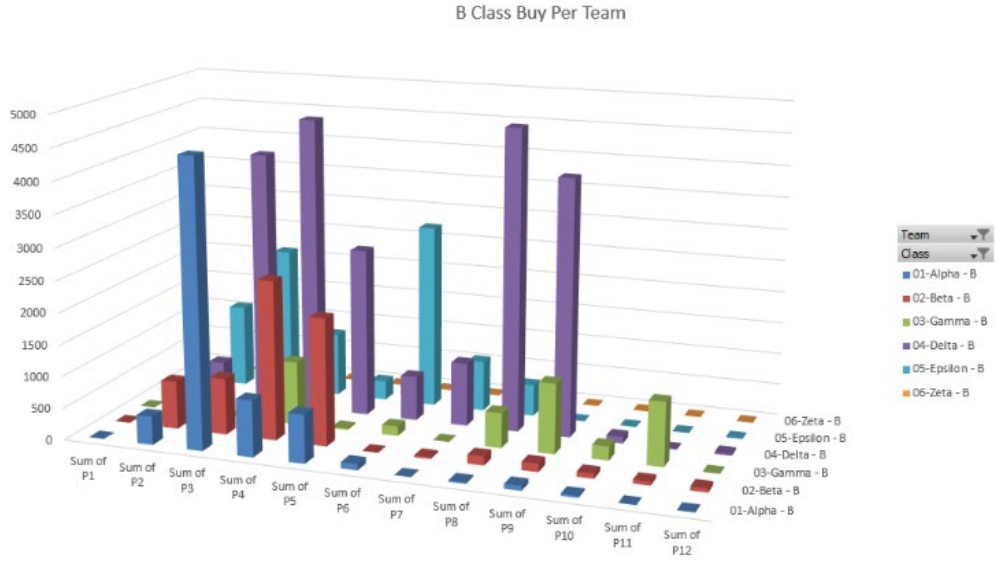
Quantity Bought by Class (A B C)



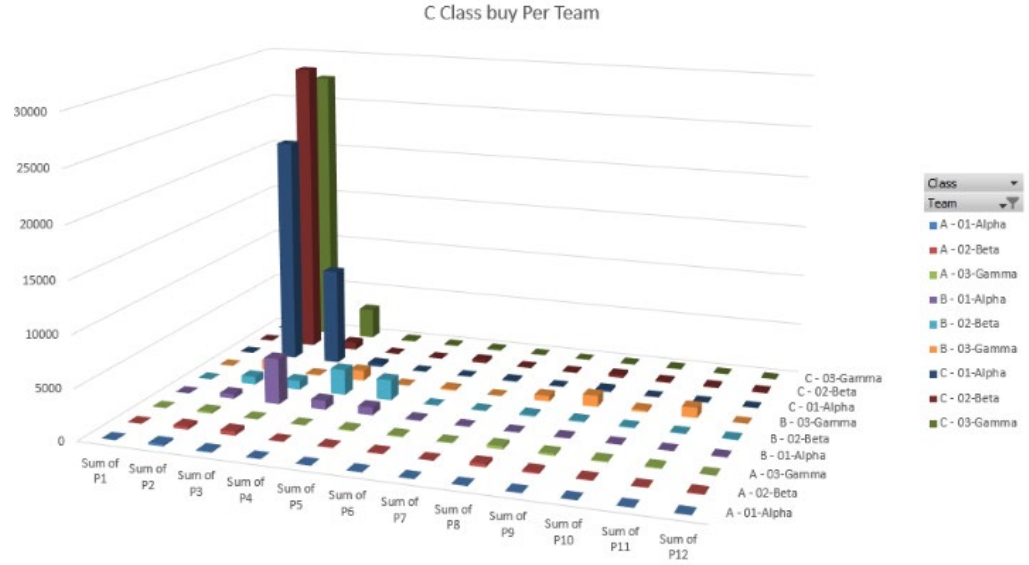
A-Class should be bought every week



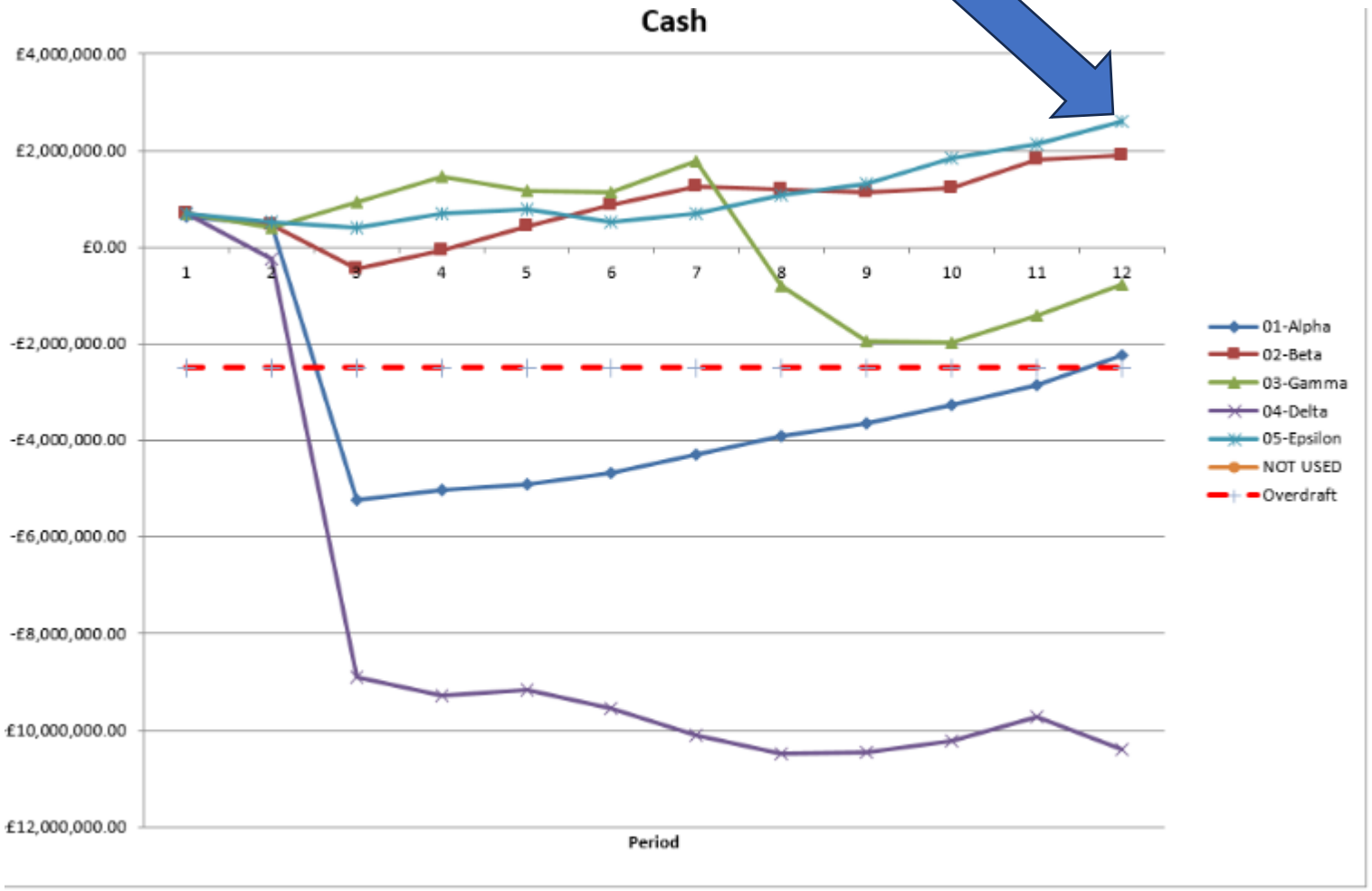
B-Class should be bought less frequently



C-Class should be bought in bulk



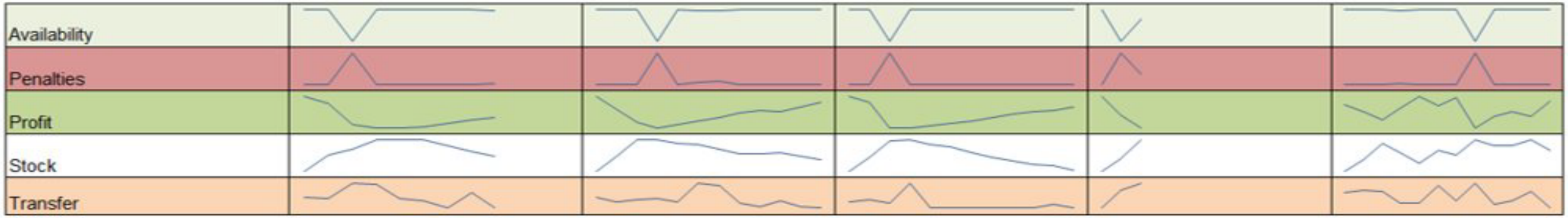
Cash Positive Throughout



Availability Key: <90 | 90-95 | 95-100

	iota	Kappa	Lambda	Mu	Nu
Month	Current Period10	End of Period12	End of Period12	Current Period4	End of Period12
Last Saved	10:24	10:39	11:21	09:56	17:55
Overall Availability	97%	99%	97%	93%	99%
Current Availability	99%	100%	100%	95%	100%
Closing stock (last period)	£ 2,517,825	£ 2,966,370	£ 1,814,282	£ 3,982,679	£ 2,514,566
Central + Customer	£ 2,684,825	£ 2,519,954	£ 1,367,273	£ 4,915,479	£ 2,066,350
Transferred	£ 30,940	£ -	£ -	£ 1,981,300	£ -
Cash	-£ 2,833,975	-£ 100,701	-£ 1,314,720	-£ 4,135,046	£ 812,678
Initial stock	£ 1,733,366	£ 1,733,366	£ 1,733,366	£ 1,733,366	£ 1,733,366
Profit	-£ 2,833,975	-£ 100,701	-£ 1,314,720	-£ 4,135,046	£ 812,678
% Profit	-45%	-1%	-16%	-197%	10%

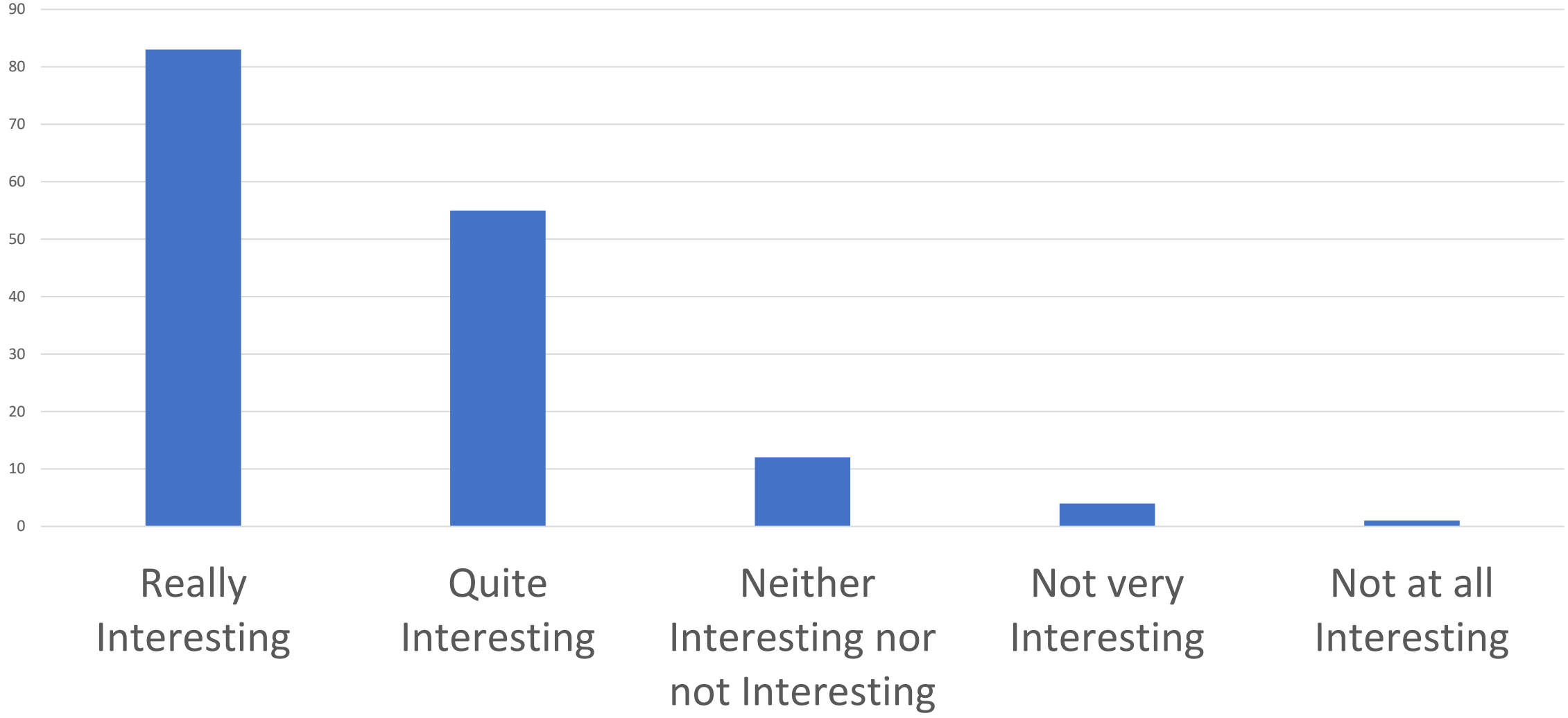
update



Future Developments and Configurations

- Can configure further disruptions in terms of supply shortages, changing lead times, supplier reliability in terms of quantity and backlog.
- Can configure the number of SKUs
- Can configure multiple sub-assemblies and change BOM
- Developing an interest rate charge on negative cash accounts and penalties on exceeding pre-arranged overdraft
- Present back using multi-media presentation that students can cross examine and evaluate each other’s performance

Did you find the module interesting



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Thank you for listening

Any Questions?